

THE ALPINE FLORA: WITH A SUGGESTION
AS TO THE ORIGIN OF BLUE IN FLOWERS.

WHEN in Colorado, I made notes on the plants of the Rocky Mountains, and collected some memoranda from various sources bearing upon alpine floras. Recently, when going over my records to ascertain as far as possible the definite results of environment on high alpine vegetation, I arrived at some conclusions which seemed to throw light on what had puzzled me before. These are at present more or less hypothetical, but I hope to work out the subject in more detail later on, so as to ascertain more clearly whether they will satisfy all the necessities of the case.

High alpine plants differ from those of the lowlands in one or more ways. They may be dwarfed, the leaves more divided or more thickly clothed with hairs, and the flowers are more often blue or pink. For the present, the dwarfing and the colour of the flowers need only be considered. Dwarfing may be—doubtless often is—the direct result of environment, as lack of nourishment. The dwarfed trees grown by the Japanese artificially in small pots are well known.

If this were the only cause of dwarfing, the alpine flora would present clear evidence for the transmission of acquired characters, as the character has undoubtedly become a *specific* one in several mountain plants. Thus, oaks are normally trees: the Rocky Mountain oak, *Quercus undulata*, is usually a shrub. The genus *Phlox* contains fine herbaceous plants, but *P. caespitosa*, which I have gathered at about 12,000 feet on the Sangre de Cristo Range in Colorado, is so dwarfed as to be called (with other dwarfs growing beside it) “flowering moss.” It appears, however, that natural selection may come into play, the low stature of these plants benefiting them in three ways:—

(1) They may escape the violence of the high winds which prevail at those altitudes; taller plants being broken off before the seed matures.

(2) They may obtain some additional warmth from their close proximity to the ground and partial shelter.

(3) The short summer of the mountain-tops necessitates very rapid development, and requires every energy to be thrown into the essential function of producing flowers and seed, leaving nothing to spare for the production of branched stems and diffuse foliage. In short, the plants are obliged to develop as *katabolically* as possible, and those which fail in the race are ruthlessly cut off by the autumn storms.

The evidence at hand tends to show the reality of this rapid development and the necessity for it. Every alpine traveller knows how rapid is the bursting into bloom of the plants but lately covered by snow and ice. Their impatience, if one may so call it, is astonishing, some plants will begin to develop under the snow. Then the flowers that are produced are very brilliant, lasting but for a short season (like some alpine Lepidoptera), and especially is it to be noted that they are nearly always *large in proportion to the size of the plant*. That is, the plants have dwarfed, but the flowers *have not become dwarfed at the same time*. This were strange, if bad nourishment were the only factor: in the light of the facts considered above it is exactly what one might expect.

The intense blue of some high alpine flowers is most noticeable, and the large number of blue flowers is equally remarkable. I never saw anything equalling in *blueness* the *Omphalodes nana* var. *aretioides* of the Colorado mountains above timber-line. The brilliancy of these flowers is almost dazzling. The large and beautiful blue flowers of species of *Gentiana*, *Polemonium*, &c., are conspicuous on high mountains. Next to the blues come the pinks. I have shown in the *Bulletin of the Torrey Botanical Club* how species of *Castilleja*, which are scar-

let or yellow at lower altitudes, become crimson-bracted as they ascend. Many other examples could be given.

I have found no one to dispute the reality of this change of colour, at least in many groups of plants. The cause of it seemed much more obscure. It is generally agreed that, developmentally, reds come after yellows, crimson follows red, and blue crimson. Further, it is supposed that this series of colours is the result of different degrees of pigmental complexity, perhaps of the nature of, or similar to, various degrees of oxidation. Katabolism, strong metabolism, produces the higher colours—the crimsons, the blues. Moisture, slow development, great growth, with an expansion of the parts—these are favourable to the yellows, and, in a less degree, to the reds; of course the green, the primitive chlorophyll, especially.

May not all this, therefore, be correlated with the dwarfing? Strong metabolism is necessary; every energy must be thrown into the inflorescence; and, as a side-result, we get the crimsons and blues of mountain flowers.

It may be, even, that all, or nearly all, blue flowers were produced in this way. Very few of those groups of plants which are never alpine have blue flowers. There will be some exceptions, of course—for instance, I do not know how to account for the blue water-lily—and there are some groups in which a blue flower, however alpine the species, seems to be unproducible. But even some of the very refractory genera, as *Erysimum* and *Troximon*, do go so far as to produce an occasional purple flower at high altitudes.

If I am right in my suggestions, the need for the selection by bees, made so much of by various authors, no longer exists. My own observations make me very doubtful whether bees do really prefer blue flowers at all, as a general thing—and I can hardly bring myself to believe, though the present hypothesis fall to the ground, that blue in flowers is a result of insect-selection.

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NOTES.

AN International Scientific Congress will be held in Moscow in 1892. It will be divided into two sections, one of which will deal with zoology, the other with anthropology and ethnography. It is expected that the meetings will be largely attended. According to the *Revue Scientifique*, there is some talk of excursions to the Caucasus and to Turkestan.

WE learn from *Science* that the United States Coast and Geodetic Survey Office lately received from its sub-office in San Francisco a telegram announcing that an agent of the Alaska Commercial Company had arrived from St. Paul, Alaska, bringing letters from the Coast and Geodetic Survey parties who have been engaged in making explorations and surveys on and near the 141st meridian of longitude (the boundary between Alaska and the British possessions). These two parties were commanded by Messrs. J. E. McGrath and J. H. Turner, assistants of the Coast and Geodetic Survey. The party under Mr. McGrath ascended the Yukon River to the boundary-line, and there made its head-quarters, while that headed by Mr. Turner went up the Porcupine River to the Rampart House (the Hudson Bay Company's trading-post in the vicinity of the boundary), and there camped for the further prosecution of their work. Both parties were at their posts early in the autumn of 1889. The records made by Mr. McGrath's party comprise a set of magnetic and meteorological observations for a year; a set of specimens of sediments obtained from filtering certain measured quantities of the water of the Yukon River, made at regular intervals; certain botanical specimens; and a series of photographs. Mr. McGrath also gathered considerable in-

formation from some of the most intelligent of the Indians whom he encountered at Forty-Mile Trading-Post. Owing to the stormy weather, Mr. McGrath was unable to obtain a sufficient number of astronomical observations to justify him in returning last autumn; and his party will therefore remain until next spring, and then descend the river, doing what work they can in the cause of science on their way down. Mr. Turner's party were much more favoured by the weather than the other party. They completed the necessary astronomical observations for the determination of the geographical position of their station on the Porcupine River at the boundary-line, also a set of magnetic and meteorological observations, and made a topographic map (on a scale of 1 : 5000) of the river in the vicinity of their camp, and a survey (on a scale of 1 : 200,000) from the boundary to Fort Yukon, a distance of about 100 miles. A small scheme of triangulation was undertaken to "locate" three monuments placed to mark the boundary-line. An exploring expedition was sent during the months of March and April to explore the line northward to the Arctic Ocean. The party visited Herschel Island. During May another trip was made about forty miles to the southward, as far as Salmon Trout River. Mr. Turner reached St. Michael's on August 30, 1890, with his party, too late to catch the steamer going south. The party will winter there, and in the spring carry the triangulation toward the mouth of the Yukon River, until relieved by orders from the Coast and Geodetic Survey Office.

THE next Deutsche Geographentag will be held in Vienna on April 1, 2, and 3.

THE other day, on the occasion of the sixtieth anniversary of the first doctorate of M. de Quatrefages, the anthropologist and zoologist, a small group of his most intimate friends and pupils met at his house and presented him with a very fine copy of an etching of himself, prepared without his having heard anything about the matter. M. de Quatrefages is over eighty years of age; he is in excellent health, and works hard. A few weeks ago he was elected President of the French Geographical Society.

IN St. Petersburg, an Institute for Experimental Medicine has been founded by the liberality of Prince Alexander Petrovitch of Oldenburg. It is intended chiefly for the study of the causes of infectious disease, and methods of prevention and cure. The Prince proposes to invite eminent men of science to make experiments in bacteriology, physiology, chemistry, biology, and the veterinary art. The building, which is being elaborately fitted up, stands in the Lapukins Kaja Street, on the banks of the Neva. Like the Pasteur Institute in Paris, it will have a department for clinical observation.

AT the meeting of the Photographic Society of Great Britain, on December 9, 1890, Mr. W. S. Bird spoke of the work done by the Committee which had been deputed to consider various questions relating to the proposed Photographic Institute. The labours of the Committee had resulted in the drawing up of a large scheme and of a smaller scheme. The larger scheme was a project of the future, but the smaller one was of a more practicable nature, and the Committee had had the advantage of conferring with the Lord Mayor on the subject, who thought that it might be possible to collect a sum which had for its limit £10,000, provided that the project was shown to be of public utility. If this was so, he thought that the photographic community generally should take some steps towards defining practical methods of carrying the scheme forward, and then they could approach the Lord Mayor with this project, and with some promises of financial support. In foreign countries the Government provided the means by which such institutions were founded. In England this was not the case, and he (Mr. Bird) felt that if this movement was to be a success, it must

begin at home, and the Photographic Society ought to use what influence it possesses to assist in the work. After some discussion the following resolution was adopted:—"That the project be submitted, in the form of a circular letter, to the different provincial and metropolitan Societies, to elicit the opinion of the photographic public generally upon the scheme now brought forward."

AT the Annual Conference of Principals of University Colleges, held at Bangor, on December 23, the following subjects were discussed:—(1) The University of London: (a) the proposed scheme for reconstituting the University; (b) local centres at provincial Colleges for the honours examinations of the University. (2) Day Training Colleges: (a) relations of the University Colleges in this connection to the Education Department and the Science and Art Department; (b) organization necessary to make these relations operative. (3) County Councils: (a) relation of County Councils to educational institutions outside the strict county area; (b) devotion of local taxation money to purposes of technical instruction. An invitation from University College, London, to meet in London in 1891 was accepted.

AT the meeting of the French Academy on December 8, M. Mascart presented a work by General A. de Tillo on the distribution of atmospheric pressure in the Russian Empire and Asia, from 1836 to 1885. The work consists of an atlas of 69 charts, and a discussion of the monthly and annual values, as well as of the variability of pressure, and the relations existing between the variations of pressure and those of temperature at 136 stations. The highest pressure quoted is 31·63 inches (reduced to sea-level) in December 1877 at Barnaul, and this is stated to be the highest reading on record. But in the Quarterly Journal of the Royal Meteorological Society for July 1887, Mr. C. Harding quoted, on the authority of Prof. Loomis, a reading of 31·72 inches on December 16, 1877, at Semipatalinsk. In NATURE, vol. xxxv. p. 344, Mr. Blanford quoted the lowest reading on record at any land station, viz. 27·12 (reduced to English standards), which occurred on September 22, 1885, on the coast of Orissa. These readings give a difference of 4·6 inches, probably the maximum range of the barometer ever observed at the earth's surface.

THE weather review accompanying the Pilot Chart issued by the U.S. Hydrographic Office states that very heavy weather prevailed in the North Atlantic during the month of November; westerly gales accompanied by heavy rain, hail, or snow, with tremendous seas, having raged over almost the entire region between Newfoundland and the British Isles, with the exception of a few days. Eight storms reached the ocean from the continent of North America, two of which crossed the British Isles. Six severe storms also originated in mid-ocean, most of which more or less affected the weather in these islands. Very little fog was reported during the month, and only one iceberg. It is proposed to publish with the next Pilot Chart a supplement devoted to the subject of ice in the North Atlantic during the season of 1889-90, which is perhaps the most notable ice season on record.

AT the recent Congress of Americanists at Paris, Dr. Seler showed that the name Anahuac had been applied by mistake to the plateau of Mexico. "Anahuac" means "on or near water," and by all ancient writers was used in the sense of coast-land. Anahuac Ayotlan was the seaboard of the Pacific; Anahuac Xicalanco that of the Atlantic. Motolinia alone used the word differently. He did not, however, apply it to the plateau, but to the whole of New Spain. According to Dr. Seler, this also was a blunder, and was due to the phrase "cem anahuac," which is used for "the whole world." The original meaning was "the entire land down to the sea-shore."

A CIRCULAR has been issued by the Department of Science and Art, calling the attention of secretaries of science classes and schools, to alterations to be adopted in the "staging" of science drawings, which are to be sent up to South Kensington for examination in April next. This "staging" has a distinct meaning different from that of "elementary," "advanced," or "honours" stages as used in respect of the subjects of science examinations held in May. The secretaries are therefore requested to avoid using the terms "elementary," "advanced," and "honours," in connection with the labelling of the drawings from copies, from measurement, and original designs which may be submitted next April. Such drawings are to be labelled according to stages about which precise instructions are given.

THE utility of the microphone for observation of earthquakes and noises was soon recognized, and in Italy especially attention has been given to adapting the instrument for this use. We learn from the *Rivista Scientifico-Industriale*, that Signor Baratta, finding some defects in a method of mechanical registration of the motions of a seismo-microphone, which he had devised, has substituted a photographic system with advantage. The device is briefly this:—The telephone wire is connected with a subterranean microphone. Before the telephone-diaphragm (vertical), and connected with its centre by a fine aluminium wire, is a short slip of the same metal, fixed below, and having a curved piece at the top, which rests against a small mirror, movable about a horizontal axis. This mirror reflects the light from a lamp and lens to photographic paper on a rotated drum. The light is momentarily shut off every quarter of an hour, by a shutter arrangement, worked electro-magnetically by the clock-work which moves the drum.

THE French Department of Trade and Industry is issuing, in two large octavo volumes, the popular lectures given in the Trocadéro Palace during the Exhibition, for the benefit of visitors. The first volume has just appeared. The subjects are most varied, and many of the lectures are valuable.

A RECENT microscopical study, by Herr Schultz, of the skin of toads and salamanders, has yielded some interesting results (*Archiv für mikroskop. Anat.*). There are two kinds of glands, mucus and poison glands. The former are numerous over the whole body; while the latter are on the back of body and limbs, and there are groups in the ear-region behind the eye; and, in the salamander, at the angle of the jaw. The mucus glands are spherical, have a clear glassy appearance, and contain mucus cells and mucus; the poison glands, which are in regular strips on the salamander, are oval, much larger, and have a dark granular look, from strongly refractive drops of poison, a good reagent for which is copper-hæmatoxylin. The poisonous elements are from epithelial cells lining the glands. The mucus glands are for moistening the skin, and the liquid has no special smell, nor a bitter or acid taste. The poison glands are of course protective, and the corrosive juice is discharged differently in toads and salamanders, on stimulating electrically; in the latter it is spirted out in a fine jet, sometimes more than a foot in length, whereas in the toad, after longer action of the current, it exudes sparingly in drops. The physiological action of the poison has lately been studied by some Frenchmen. There is no reason, according to Herr Schultz, for supposing that the mucus glands sometimes become poisonous.

THE preliminary copy of the new map of the Chin-Lushai country, prepared for the surveys made during the recent military expeditions, shows, according to an Indian paper, what remarkable progress has been made in filling up the blank spaces which disfigured the old survey sheets. In the expedition of 1871-72 the country for some considerable distance to the south of Manipur was surveyed, and now the operations from the

Chittagong side and from Upper Burmah have enabled the British officers to map in the hill tracts between Demagiri and Kan. Fort White, to the north-east, has also served as a base for valuable observations, while on the south-east the Chinbok country has also been explored. During the present winter several survey parties will be sent out, and a year hence the whole mountainous region between Manipur and Arakan will probably have been mapped.

THE wren is generally supposed to be a gentle little bird; yet on occasion it seems capable of displaying anything but an amiable temper. In the current number of the Selborne Society's magazine, Mr. Aubrey Edwards gives from his note-book the following account of what he calls "a disgraceful scene" between two male wrens:—"April 15, 1889.—I have just been watching two golden-crested wrens fighting. They first attracted my attention by getting up from the ground almost under my feet, and engaging again and falling to the ground. Then rising again one chased the other into a yew-tree near, where I had a good close view of them as they challenged each other, ruffling their feathers, shaking their bodies, singing and dancing about with crests erected, the sun shining on the orange-coloured crests—such a pretty sight. After they had been talking big at each other for some minutes, the hen arrived on the scene, and a desperate fight ensued, the two cocks falling to the ground in fierce embrace, rolling over each other occasionally, but for the most part lying still on the ground with their claws buried in each other's feathers for about a minute. The hen was close by them on the ground, moving about and looking very much concerned at the affray. Her pale yellow crest contrasted notably with the rich orange of the males. After getting up, renewing the combat in a currant bush, falling again and struggling on the ground, they rose and had a chase round the yew-trees, the hen following to see the fun, and presently went off and were lost to view."

DURING the past year the question of technical education in Burmah was taken up under the orders of the Government of India. A new set of examination standards was considered; and at the same time a survey was made of the industries practised in Lower Burmah. A provincial Board is at present being constituted to consider the results of the survey, and to advise the Government generally in all matters connected with technical and industrial instruction. A sum of Rs. 10,000 has been allotted in the current year's budget, and it is hoped that the cause of technical education has secured a real and substantial foundation for future progress. Four engineering pupils at the Sibpur College were some time ago in receipt of Burmah scholarships, but the grant of these scholarships has now ceased, and no more engineering students will be sent to Calcutta.

THE Government of Bombay, in concluding a recent resolution on education in the Presidency, remarks that the degree to which private enterprise has expanded under the revised Grant-in-aid Code has exceeded all anticipations. In 1884-85 the expenditure on institutions maintained by the Department was Rs. 8,47,260 out of a total expenditure of Rs. 41,42,734. It is now little more than 8 lakhs out of 56½ lakhs of expenditure. The whole growth of ways and means has thus been left to other agencies than Government. In the same year aided institutions under private management received from provincial revenues under 2 lakhs, and they now receive from that source alone nearly 4½ lakhs. Private enterprise is becoming the chief power in educating the people. Another marked change is the growth of technical education and the introduction of various types of instruction. In 1884-85 the greater part of the expenditure by Government on its own institutions, which aggregated Rs. 8,47,260, was assigned as follows: nearly 6 lakhs to col-

egiate and secondary education, and 1½ lakhs to special education. In the current year Rs. 2,39,479 out of the 8 lakhs spent on Government institutions were devoted to special education. Private enterprise manages special institutions at a cost of Rs. 1,46,261, whereas the expenditure on this head by aided schools in 1884-85 was only Rs. 39,319. There is thus a greater diversity introduced into educational activity as well as into educational agency. Collegiate and secondary education of the ordinary type receive more expenditure than they did, but there is still greater expansion in other directions. The vastly increased employment of Municipal and Local Boards in the management of primary education is another marked feature of recent years. The tendency of education to range itself under diverse forms of instruction, and under a great multiplicity of controlling agencies, renders the task of administration and of apportionment of public funds as grants-in-aid more difficult. It is remarked with satisfaction that complaints against the Grant-in-aid Code are never heard, and that the record of each succeeding year shows increasing attendance at schools and the enlistment of larger private resources in the work of education. "The Governor in Council is satisfied that the Report of public instruction for the year ending March 31, 1890, will be generally regarded as affording proof of the sagacity with which the Department was administered, and new impulses given to it during the administration of His Excellency the late Governor" (Lord Reay).

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus* ♀) from India, presented by Mr. P. Boulton; a Tuatera Lizard (*Sphenodon punctatus*) from New Zealand, presented by Captain Worster; two Common Marmosets (*Hapale jacchus*) from South-east Brazil, deposited.

OUR ASTRONOMICAL COLUMN.

GREENWICH SPECTROSCOPIC OBSERVATIONS.—The results of the spectroscopic and photographic observations made at the Royal Observatory, Greenwich, in the year 1889 have recently been issued. Mr. Maunder examined the spectrum of χ Cygni on June 3, and compared it with the spectrum of hydrogen as given by a vacuum tube, and that of carbon as given by a Bunsen flame. C and F were not present as bright lines. There was some uncertainty about the G hydrogen line, a bright spot being suspected at or near its position in the violet region. D_3 was not seen as a bright line, but there was a brighter part about λ 5823, which may have been "a mere effect of contrast, or a local brightening of the continuous spectrum." It is also recorded that "the close correspondence as to position of the green and blue bands of the hydrocarbon spectrum with two of the bright zones or interspaces of the stellar spectrum was very apparent. No such correspondence was evident in the case of the yellow band." The mean wave-lengths obtained from two sets of measures of the more refrangible edges of Dunér's bands VII. and IX. are 5170 and 4766. On June 17 an observation was made of the spectrum of Uranus. The spectrum was traced from about λ 6200 to about λ 4600. Measures of the positions of two "dark bands," and an "ill-defined bright region which seemed to consist of two diffused bright bands," gave the following mean wave-lengths:—

Object measured.	Mean wave-length.
Darkest line	5419
Bright band	5336
Bright band	5276
Dark line	4866

"Other irregularities in the brightness of the continuous spectrum were suspected on either side of the principal dark line."

Measures of two of the bright lines in the spectrum of R Andromedæ were obtained on October 19. The brightest line

was found to have a wave-length 4872, and was probably F, whilst the position of a feeble bright line was determined as λ 5136.

The spectrum of Davidson's comet (e 1889) was observed on August 29. It is recorded that "one bright band in the green could be distinctly made out when the slit was opened very widely. It coincided nearly, if not exactly, with the green band of the hydrocarbon spectrum." No measures were made of the wave-length of the bright band.

The other observations contained in this publication refer to the motion of stars, the sun, moon, and planets in the line of sight, and measures of photographs of the sun.

The volume of "Greenwich Observations" for 1888 has also been issued, and is of the usual character.

COMETS ZONA AND SPITALER.—The following elements have been computed for Spitaler's comet:—

$T = 1890$ October 26.50833 Berlin mean time.

$$\left. \begin{aligned} x &= 58 \ 24 \ 28.2 \\ \Omega &= 45 \ 7 \ 51.2 \\ i &= 12 \ 51 \ 49.0 \\ \phi &= 28 \ 11 \ 26.6 \end{aligned} \right\} \text{Mean Eq. } 1890.0.$$

$$\log a = 0.537532$$

$$\mu = 554''.2$$

$$\text{Period} = 6.4 \text{ years.}$$

Ephemerides for Berlin Midnight.

ZONA'S COMET.

1891.	R.A.	Decl.	Bright- ness.
	h. m. s.	° ' "	
Jan. 2 ...	2 14 42 ...	+ 29 14.5 ...	0.37
" 4 ...	1 57 59 ...	28 53.1 ...	
" 6 ...	1 54 36 ...	28 32.8 ...	0.33
" 8 ...	1 51 31 ...	28 13.6 ...	
" 10 ...	1 48 42 ...	27 55.6 ...	0.29

SPITALER'S COMET.

1891.	R.A.	Decl.	Bright- ness.
	h. m. s.	° ' "	
Jan. 5 ...	4 52 24 ...	+ 40 22.5 ...	0.71
" 9 ...	4 51 52 ...	40 25.5 ...	
" 13 ...	4 51 58 ...	40 25.5 ...	
" 17 ...	4 52 49 ...	40 23.5 ...	
" 21 ...	4 54 24 ...	40 19.5 ...	

Brightness at discovery = 1.

Zona's comet is therefore still near Triangulum. Spitaler's comet is in Auriga, and not far from Capella.

The sidereal time at 10 p.m. on January 1 is 4h. 45m. 27s., and on January 10 is 5h. 20m. 30.1s.

THE LEONID METEORS.—The current number of *Comptes rendus* (December 22) contains a note from Prof. Denza, the Director of the Vatican Observatory, on the observations made in November 1890 under the direction of the Italian Association for the Observation of Luminous Meteors. The results of the observations made at seven stations on November 13-14, 14-15, and 15-16 are tabulated. They show that the number of meteors seen was greater on November 15-16 than on November 14-15, and much greater on these evenings than on November 13-14. In previous years the maximum occurred on November 13 or 14.

The whole of the observations of this year indicate that the Leonids were more frequent than in previous years, hence it is probable that this augmentation will go on until the next shower in 1899.

SPECTROSCOPIC NOTE (D_3).—The Rev. A. L. Cortic, S. J., has brought forward the question, "Has the line D_3 a coincident dark line in the solar spectrum?" From a discussion of available observations, and an examination of some photographs taken by Mr. Higgs with a Rowland grating, it is concluded—

(1) That D_3 has been seen dark in a sun-spot.

(2) That there is a faint dark line in the solar spectrum, at least within two-tenths of a tenth metre from the bright line.

(3) That this line is due to our atmosphere.

(4) That observers are disagreed as to whether the dark and bright lines coincide in position. (*Monthly Notices*, November 1890.)